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ONSCREEN EVALUATION OF OMR SHEETS

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Abstract:

Testing the knowledge of a person using Multiple Choice Questions(MCQ) has increased gradually over the period of time. Especially in the Education Industry(like schools and colleges) it has become more prevalent to use tests with MCQ. To evaluate the MCQ pattern of tests we generally use a manual method or the OMR technology. But, in real time it is difficult to correct huge number of tests manually and the OMR machine proves to be expensive. Also correcting manually will be highly time taking and there would be human errors. Our proposal is to address this issue by applying "Image Processing" technique in Python in the form of in open CV library. Open CV library is available for image processing in Python. In order to get the most effective output, We use the Django framework along with Python. The Open CV is a library of programming functions mainly aimed at real-time computer vision.

Keywords— About E-assessment, computer-based assessment, computer-assisted assessment, computer-aided assessment, examination, exam, image processing

1. INTRODUCTION:

Multiple choice questions have become an integral part of the educational system. Standard tests also use multiple choice questions to evaluate students' academic performance. It is simple and easier.

Mostly the traditional examination models are used concerning those subjects who require such a way to be examined accordingly. From now on the paper-based examination method will be discussed, since it is the main concern of this paper. The keyword "e-assessment" refers to electronic assessment as software is used to mark the exam papers filled by the students after the exam is completed.

Multiple choices Questions (MCQ) are a form of an objective assessment in which respondents are asked to select only correct answers out of the choices from a list. The multiple choice format is most frequently used in educational testing, in market research, and in elections, when a person chooses between multiple candidates, parties, or policies.

In this paper we are using image processing to accomplish the MCQ correction in very easy manner. It produces the great effort to deal and to remove the barriers of multi choice assessment correction. In this we are using array format to correct the answer paper which is photo copier and uploaded by user. The main concept is to get the image and get the answer which is shadowed by user.

2. LITERATURE REVIEW:

The OMR scanning evaluation method was first employed in the 1950s, with a system that detected graphite particles on the page using a series of sensing brushes [1]. Azman Talib, Norazlina, Ahamad, and Woldy Tahar [2] use a matching-based technique. The training phase and the recognition phase were the two phases of the strategy. The OMR sheet image is recorded using a webcam during the raining phase, and the image is then processed using smoothing filter techniques. Then, manually choose a rectangle ROI (Region of Interest) around one set of response blocks with the question number as the template. Matching is done in the recognition step by placing the template image on the OMR sheet. Finally, the intensity levels of the template and candidate images are compared to see if the candidate answer matches the template [3]. A scanner is used to capture the image of the OMR sheet. The sheet image is then pre-processed, with the coloured image being converted to grey tone. It is also proportionally downsized to a width of 400 pixels. In grading the test, four stages were counted after pre-processing. The acquired image is projected horizontally and vertically in the first stage to observe the grid zone with a high frequency of ON pixels, and the image's position is identified in the second step by evaluating the grid lines in the answer zone (separate one question from another). Segmenting the questions is the third phase. In the last phase, each question's decision is made on the answer sheet. Nutchanat sattayakaree [3] calculates the average

choice width utilising the local vertical projection profile with threshold the ON pixels.

The ROI of each question is trimmed after a scanned OMR sheet image is transformed to a binary picture using thresholding algorithms. Find the correct answers by matching the X and Y coordinates of the indicated circles with the pre-defined coordinates. The ROI then goes lower, repeating the procedure till the paper is finished. Finally, the accurate matches are counted to determine the number of appropriate replies, as done in Ms. Sumitra B. Gaikwad's study [4]. Ammar Awny Abbas takes a different approach, reading both the ROI picture of the base paper with the corrected answers and the test paper images using a scanner, then converting both images to binary tone and inverting them. The test paper image is then rotated to align with the base paper image after the little objects have been removed. Following that, questions with more than two responses are deleted, and the pre-processed two images are multiplied, with only the correct answers appearing in the final image [5]. The image is then rotated if it is not straight, and the bubbles in the sheet are counted to see if they are filled or not, as described by Garima Krishna, Hemant Ram Rana, and Ishu Madan [6].

3. PROPOSED SYSTEM:

The proposed system digitises the answer sheet in the specified pattern and uploads it to the specified system. To correct the answer, digital image processing is employed to retrieve the answer sheet and read the image. This strategy significantly reduces both machine and human dependency. This solution maximises efficiency by combining the Django framework with Python to do image processing. The most significant impact is the open CV library, which is freely accessible.

4. ADVANTAGES:

Machine independence is a feature of the suggested system. It is very easy to manage, easy to use and it is more cost effective. As a result, it is quite simple to go to taking care of the images.

5. IMPLEMENTATION:

The following flow chart shows the steps in the methodology of the proposed research study.

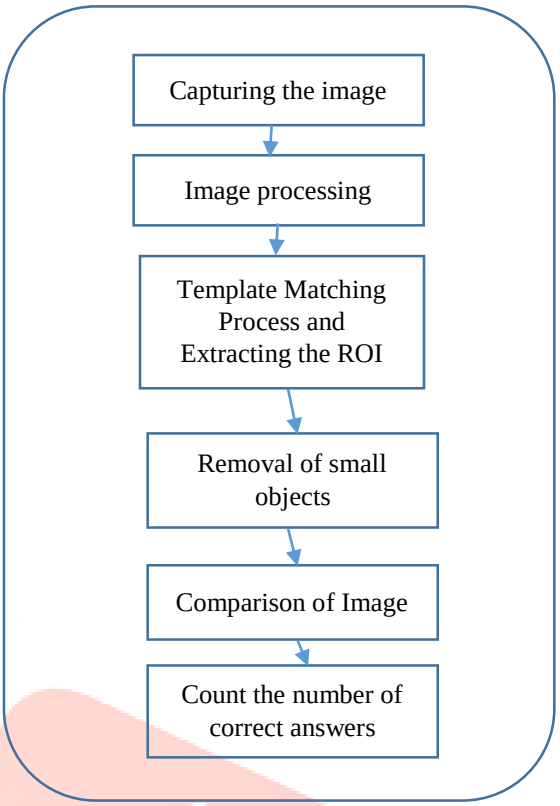

Figure 1: Implementation steps

5.1. Capturing the images:

The faculty will snap the students' response papers and submit them to the homepage. After obtaining the initial image, the largest rectangle is discovered. After that, the designated region was automatically reduced and straightened before being stored in a matrix.

The cropping operation will make the photos smaller. In this stage, each answer script to be marked must be placed within a three-second area that covers the entire frame of the collected image, as the entire process setup must be completed within the time limit before moving on to the next primary image (answer script).

5.2. Image processing:

The Digital Image Processing technology can be used to examine the photographs. The OpenCV library in Python is used to do this. The matrix form is designed with an answer key to help you identify and offer the correct response based on the images. Photos are transformed to grey tone using the described method. The photos are then smoothed using the Median filter to improve the edge identification process and crop the ROI appropriately.

5.3. Template Matching Process and Extracting the ROI:

The practise of finding similar parts of a picture that match a template image is known as template matching. During the matching process, the template image advances pixel by pixel to all feasible regions in the primary picture and computes a numerical index that indicates how well the template matches in that area.

The strength of the matching process is represented by Metric R, which is calculated by shifting the template one pixel at a time in the original image. The normalised square difference matching approach was employed to perform the matching in the suggested study. I (M x N) represents the primary image, T (m x n) represents the template image, and R (M – m + 1, N – n + 1) represents the output. The calculated outcome is as follows:

$$R_{(X, Y)} = R_{(sq\text{-}diff)\,(x, y)} / Z_{(x, y)} \quad \text{..... (1) where,}$$

$$R_{(sq\text{-}diff)} = \sum [T(x^1, y^1) - I(x+x^1, y+y^1)]^2 \quad \text{..... (2)}$$

$$x^1 = 0 \ldots m-1,\ y^1 = 0 \ldots\ldots n-1$$

$$Z_{(x, y)} = \sqrt{\sum T(x^1, y^1)^2 . \sum I(x+x^1, y+y^1)^2} \quad \text{..... (3)}$$

The minimum value is found to get the perfect match in R during the matching process. Matched area were automatically cropped from the primary image after the matching process. Then the cropped image is stored in a matrix with the same size of the template image.

5.4. Removal of small objects:

Before moving on to the final phase of comparing two images (the binary toned template image and the cropped image) to level up the correctness of the entire process, the small and noisy blobs (small white objects) must be deleted from the template image.

5.5. Comparison of Images:

A key feature of the right marked response is that it will show a white blob in both the cropped and template areas that differs from the correct answer. Using this characteristic attribute, the 'AND' operation is applied by taking both images pixel by pixel. In the resulting image, just the correct response region will emerge. In both photos, the correct answer region is white, and the intensity value is 1. The intensity number 1 represents all the boxes or bubbles in the template image with correct answers. The same regions in the cropped image with intensity value.

5.6. Count the number of correct answers:

To turn the values from the previous module into calculation, various math functions are used. After the 'AND' operation, the little noisy blob with a size less than 80 pixels will be erased. Only the blobs will remain as correct responses. Finally, the number of blobs is used to determine the number of correct replies and it will display the total percentage earned by students.

6. RESULTS:

The suggested algorithm is tested on three distinct types of papers, as shown in table 1. Type 1 has 40 answers with 10 answers in each column, type 2 has 20 answers with 10 answers in each column, and type 3 has 50 answers with 10 answers in each column.

Answer Sheet	Type Number of Questions	Accuracy Type
TYPE 1	40	97%
TYPE 2	20	100%
TYPE 3	50	96%

The JPEG format is used to save the photos because it is smaller than other formats like PNG and BMP. To calculate the number of correct answers, each MCQ paper is compared to its template image for each paper format. During the testing process, twelve students were asked to respond for printed papers in various formats by filling in the appropriate bubble or square partially or entirely with either a pen or a pencil. In both circumstances, the proposed algorithm could recognise the correct replies. A sheet is processed in less than 5 seconds on average. As a result, the average accuracy reached 97.6 percent.

7. CONCLUSION:

The MCQ Test format has a unique technique of correcting and administering tests, which makes it extremely tough. With the help of Image Processing the proposed solution addresses the issue and solves the problem. Both of these strategies comes when dealing with MCQ Test Correction. It has its own set of restrictions that will be addressed in the future, but in the meanwhile, it is a better option than the alternatives. Many services will be able to be integrated in this application in the future.

The highlighted "Exams" software system is in alpha mode, which implies that some of the previously envisioned features have been partially built and are available for usage. Users can generate exam sheets, access and update the database, upload photographs, and check the answers by using this software application. The image processing portion of the system has shown good results, as it appears to be fast enough to process a large number of images at once without making a single mistake. The Exams software system has enormous potential for further development, and by taking this chance when it is completed and launched, it might play a significant part in the future of the digitization of education revolution.

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